REMARKS

These remarks and the above amendments are responsive to the final Office action dated June 1, 2005, and support the accompanying Request for Continued Examination as a submission under 37 C.F.R. § 1.114(c). Claims 54-56 and 58-77 are pending in the application. The Office action can be summarized as follows:

- Claims 54-66 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 4,672,040 to Josephson ("Josephson") in view of U.S. Patent No. 5,855,790 to Bradbury et al. ("Bradbury").

- Claims 54-66, 68-69, 74-75 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Josephson in view of U.S. Patent No. 5,328,681 to Kito et al. ("Kito").

- Claims 70-72 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Josephson and Kito in view of U.S. Patent No. 4,048,298 to Niswender ("Niswender").

- Claim 73 was objected to as being dependent upon a rejected base claim, but was indicated to be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claim.

Applicant thanks the Examiner for indicating the allowability of the subject matter of previously presented claim 73, which has now been rewritten in independent form as new claim 77. Applicant traverses the rejections of the remaining claims because applicant does not believe that the cited references or any other references teach or suggest a method of separating a target material from a liquid mixture as recited in the rejected claims. Nevertheless, to expedite issuance of a patent, applicant has amended: (1) independent claim 54 to include an additional limitation, and to more particularly point out and distinctly claim aspects of the invention; (2) dependent claim 58 to correct an error in the claim; and (3) dependent claim 68 to provide for proper antecedent basis

of all the elements of the claims. Applicant also has cancelled claim 57 and has included a new claim 76 that depends from independent claim 54. The new and amended claims focus on a multi-step process of separating a target material from a liquid mixture that applicant believes are clearly distinguishable from the cited references, either alone or in combination. Thus, applicant respectfully requests favorable consideration of the amended claims, and issuance of a Notice of Allowance.

I. Request for Continued Examination

Applicant is submitting herewith a Request for Continued Examination (RCE) under 37 C.F.R. § 1.114. This Request complies with the requirements of 37 C.F.R. § 1.114. In particular:

(i) Prosecution in the application is closed, since the last action was a final Office action under 37 C.F.R. § 1.313.

(ii) The Request is accompanied by a submission as set forth at 37 C.F.R. § 1.114(c), specifically, the accompanying amendment and remarks, and a supplemental Information Disclosure Statement.

(iii) The Request is accompanied by the fee set forth at 37 C.F.R. § 1.17(e).

Accordingly, applicant respectfully requests grant of this Request for Continued Examination.

II. Supplemental Information Disclosure Statements

Applicant is submitting herewith a Supplemental Information Disclosure Statement (IDS). Applicant respectfully asks the Examiner to consider this IDS, and the references cited therein, in reviewing this communication.

III. Rejection of Claims 54-66 under 35 U.S.C. § 103(a)

Claims 54-66 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Josephson in view of Bradbury. Applicant traverses these rejections. Nevertheless,

to expedite issuance of a patent, applicant has amended independent claim 54, to include an additional limitation, and to more particularly point out and distinctly claim aspects of the invention. Applicant has cancelled claim 57. Applicant also has amended claim 58 to correct an error. In view of these amendments, and for the reasons set forth below, applicant requests that the Examiner withdraw the rejections of claims 54-56 and 58-66.

A. Brief Overview of Claimed Invention

Claim 54, as amended, is drawn to a method of separating a target material from a liquid mixture that includes, among other steps: (1) forming and at least substantially purifying aggregates having a plurality of crystallites of a magnetizable metal oxide, wherein the formed and at least substantially purified aggregates have a particle size of about 50 nm to about 500 nm; (2) coating the formed and at least substantially purified aggregates with a polysaccharide material to form coated aggregates; (3) treating the coated aggregates by attaching a specific binding member having a binding affinity for the target material to the polysaccharide material to form treated aggregates; and (4) combining the treated aggregates with the liquid mixture containing the target material for a sufficient time for the target material to bind to the specific binding member.

The size range claimed in step 1 provides for aggregates that have useful properties. Specifically, the aggregates are small enough to form stable colloidal solutions, but large enough to have a significant magnetic moment that allows them to be separated easily with a small magnet. (See paragraphs 18 and 45-46 of the specification). The aggregates also have a surface area that is large enough to bind a sufficient quantity of coupling molecules. *Id.*

The step of coating the formed and at least substantially purified aggregates with polysaccharide does not require the aggregates to be directly coated with polysaccharide. For example, the step may include, among others: bonding the polysaccharide material directly to the aggregate of crystallites of the magnetizable metal oxide (paragraph 52 of the specification, and dependent claim 63); or bonding an organosilane directly to the aggregate of the crystallites, and then bonding the polysaccharide material to the organosilane (paragraphs 48-52 of the specification, and dependent claim 64).

B. Brief Overview of the Cited References

1. Josephson

Josephson appears to disclose a method of separating target materials from a liquid that includes, among other steps: (1) preparing magnetic particles by base precipitating metal oxide crystals (column 9, lines 63-66); (2) bonding silane to the magnetic particles (column 10, lines 5-14); (3) covalently attaching the silane to a bioaffinity adsorbent, such as antibodies, antigens, proteins, nucleic acids, monosaccharides, or polysaccharides (column 10, lines 14-20; table III); and (4) combining the product of step 3 with the liquid containing the target material so that the target material binds to the bioaffinity adsorbent.

The method claimed in amended claim 54 is distinguishable from the method disclosed in Josephson. The treated aggregates claimed in amended claim 54 include a specific binding member that has affinity for the target material, and is attached to the polysaccharide material. In contrast, the polysaccharide disclosed in Josephson ***is*** the specific binding member having affinity for binding target lectins and receptors (See

Table III). Although Josephson appears to disclose attaching polysaccharides to a silane coating, Josephson does not disclose attaching a specific binding member having affinity for a target material to the polysaccharide material.

2. Bradbury

Bradbury appears to disclose a method of preparing magnetic resin particles for use removing pollutant ions from an aqueous solution. The magnetic particles include a magnetic core (e.g., magnetite having a particle size of 7-12 microns) surrounded by a fibrous material (e.g., cellulose and agar). (Column 3, line 10 to column 4, line 47). The magnetic particles are then treated with a solid binding agent (e.g., acrylamide), thereby forming a solid resin used to remove pollutant ions from a solution.

The aggregates claimed in amended claim 54 are distinguishable from the magnetic particles disclosed in Bradbury. The formed and at least substantially purified aggregates claimed in amended claim 54 have a particles size of about 50 nm to 500 nm. As described above, the aggregates are therefore small enough to form stable colloidal solutions, but large enough to have a significant magnetic moment that allows them to be easily separated with a small magnet. (See paragraphs 18 and 45-46 of the specification). The aggregates also have a surface area that is large enough to bind a sufficient quantity of coupling molecules. *Id.* In contrast, the magnetic particles disclosed in Bradbury have particle sizes between 7-12 microns, which are useful for ion exchange, but which do not remain in colloidal form.

C. Claims 54-56 and 58-66 are Not Obvious Over Josephson in View of Bradbury

Amended claim 54 is not obvious over Josephson in view of Bradbury, because this combination does not teach each and every element of the claim. In the Office

action, the Examiner stated that it would be obvious "to coat a polysaccharide on the magnetic particles as taught by Bradbury and use in the method of Josephson since both teach the same method of preparing the magnetic particles coated with a polymer." See Page 4 of the Office action dated June 1, 2005. Even if the magnetic particle of Josephson is directly coated with polysaccharide, Josephson does not disclose attaching a specific binding member having affinity for a target material to the polysaccharide material. Rather, the polysaccharide material in Josephson ***is*** the specific binding member. Therefore, the combined teachings of Josephson and Bradbury, as asserted by the Examiner, do not render amended claim 54 obvious.

Applicants also submit that it would not be obvious to combine the Bradbury method of preparing and using magnetic resin particles with the Josephson method of separating target materials from a liquid, because Josephson explicitly teaches away from this combination. Specifically, Bradbury discloses coating magnetite having particle sizes between 7-12 microns with cellulose and acylamide. Josephson states that "large magnetic particles (mean diameter in solution greater than 10 microns(μ)) can respond to weak magnetic fields and magnetic field gradients; however, they tend to settle rapidly, limiting their usefulness for reactions requiring homogeneous conditions. Large particles also have a more limited surface area per weight than smaller particles, so that less material can be coupled to them." Column 3, lines 18-25 of Josephson. Therefore, it would not be obvious to one of ordinary skill in the art to combine the Bradbury method with the Josephson method.

Claims 55-56 and 58-66 depend from claim 54 and are therefore allowable for at least the same reasons as described above for claim 54.

IV. Rejection of Claims 54-66, 68-69, and 74-75 under 35 U.S.C. § 103(a)

Claims 54-66, 68, 69, and 74-75 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Josephson in view of Kito. Applicant traverses these rejections. Nevertheless, as described above, applicant has amended independent claim 54 to include an additional limitation, and to more particularly point out and distinctly claim aspects of the invention. Applicant has cancelled claim 57, and has amended claim 58 to correct an error. Applicant also has amended claim 68 to provide for proper antecedent basis. In view of these amendments, and for the reasons set forth below, applicant requests that the Examiner withdraw the rejections of claims 54-56 and 58-66, 68-69 and 74-75.

A. Brief Overview of the Cited References

1. Josephson

Josephson, as discussed above, does not disclose attaching a specific binding member having affinity for a target material to a polysaccharide material, as claimed in claim 54.

2. Kito

Kito appears to disclose a composition containing magnetic metal oxide ultrafine particles for use in the fields of medicine and diagnostic drugs. Kito states that a fluid containing small magnetic particles is useful "as an iron-supplementing agent, an X-ray contrast agent and a MRI contrast agent, for measurement of bloodstream, as a hyperthermic agent, and further as a carrier in case of intensive administration of a drug to a tropical part utilizing magnetic field, etc." (Column 12, lines 31-36). However, Kito also states that magnetic fluids are toxic, and can cause platelet aggregation when

administered to living organisms. (Column 1, lines 17-52). Consequently, Kito discloses that coating the ultrafine magnetic particles with a polysaccharide, a polysaccharide derivative and/or a protein, and mixing the coated particles in aqueous solution with an organic monocarboxylic acid, substantially reduces the toxicity of the magnetic fluid without substantially changing the magnetic properties, metabolic properties or tissue specificity of the magnetic particles. *Id.*

The method claimed in amended claim 54 is distinguishable from the method disclosed in Kito. The polysaccharide coating of claim 54 is attached to a specific binding member that has affinity for a target material. In contrast, while Kito discloses coating magnetic particles with a polysaccharide, the polysaccharide is not used to attach a specific binding member for a target material, or to directly bind to a target material directly. The only asserted purpose for the polysaccharide coating is to stabilize the metal oxide complex. (Column 6, lines 8-21). Further, although Kito discloses that the polysaccharide may be a carboxyl polysaccharide, Kito does not discuss the function of the carboxyl group. (Column 3, line 54). Presumably, the polysaccharide's carboxyl group would either help stabilize the complex in solution, or would provide some benefit with respect to the toxicity of the magnetic fluid.

B. Claims 54-56, 58-66, 68-69, and 74-75 are Not Obvious Over Josephson in View of Kito

Amended claim 54 is not obvious over Josephson in view of Kito, because this combination does not teach each and every element of the claim. In the Office action, the Examiner indicated that "[c]oating the polysaccharide on the magnetic particles provides specific functional group that attaches a ligand/binder, which in turn couples to a substance of interest for use in assays." (Page 6, paragraph 2 of the Office action

dated June 1, 2005). However, as discussed above, neither Josephson nor Kito discloses using the polysaccharide to attach a specific binding member having affinity for a target material. Therefore, the combined teachings of Josephson and Kito, as asserted by the Examiner, do not render amended claim 54 obvious.

Claims 55-56, 58-66, 68-69 and 74-75 depend from claim 54 and are therefore allowable for at least the same reasons as described above for claim 54.

V. Rejection of Claims 70-72 under 35 U.S.C. § 103(a)

Claims 70-72 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Josephson in view of Kito and Niswender. Claims 70-72 depend from claim 54 and are therefore allowable for at least the same reasons as described above.

VI. *Conclusion*

In summary, independent claim 54 provides a method for separating a target material from a liquid mixture that is neither taught nor suggested by the art of record and that may provide significant advantages over the prior art. Thus, for at least the reasons indicated above, claim 54 is patentable over Josephson, Bradbury, Kito, Niswender, and the other references of record, either alone or in combination. Claims 55-56, 58-75 and new claim 76 all depend from and further limit claim 54 and so are patentable for at least the reasons that claim 54 is patentable. Claim 77 is a new claim that includes all of the limitations of previously presented claim 73 rewritten in independent form and is therefore allowable as previously indicated by the Examiner.

Applicant believes that he has addressed all of the issues raised by the Examiner in the Office action dated June 1, 2005, and that the application currently is in condition for allowance. However, if the Examiner has any questions or comments, or if a

telephone interview would advance prosecution of the application, the Examiner is encouraged to call applicant's undersigned attorney at the telephone number listed below.

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail, postage prepaid, to: Mail Stop RCE, Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450, on September 1, 2005.

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Respectfully submitted,

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